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PATENT

Attorney's Docket No. NL00 0694

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

JOHAN D. VAN DER TANG

Application No.: 09/998,034

Filed: 11/29/2001

For: MULTI-PHASE LC OSCILLATOR

Group Art Unit: 2817

Examiner: Chang, Joseph

Appeal No. _____

BRIEF FOR APPELLANT

Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This appeal is from the decision of the Primary Examiner dated 3/29/2004, finally rejecting claims 1-5, 10, 11 and 20, which are reproduced as an Appendix to this brief.

The Commissioner is authorized to charge the fee of \$330, and any other fees that may be required by this paper, to Deposit Account No. 14-1270.

(1) Real Party in Interest

The real party in interest is the assignee, Koninklijke Philips Electronics N.V.

(2) Related Appeals or Interferences

Applicant is not aware of any related appeals or interferences.

(3) Status of Claims

Claims 1-20 remain pending in the present application. Claims 1-5, 10, 11 and 20 have been finally rejected and are on appeal.

(4) Status of Amendments

All amendments have been entered. No amendment after final has been submitted.

(5) Summary of the Invention

The present invention relates to an oscillator (1, Fig. 1) of a type that may be used within a radio receiver. The oscillator is able to operate at an optimum point even if the amplifier used within the oscillator has a parasitic phase shift. The oscillator is therefore able to achieve maximum carrier to noise ratio, an important factor in radio receiver applications.

This ability of the present oscillator is achieved in substantial part by the use of voltage-to-current converters, used to create a 90 degree phase shift. Various suitable voltage-to-current converters are illustrated in Figures 2, 3 and 5 of the specification. As illustrated in

Figure 4 of the specification, non-ideal parasitic phase shifts may be compensated using, for example, a parallel-coupled transconductance amplifier so as to achieve an exact 90 degree phase shift. In this manner, the oscillator may be caused to operate at the maximum phase slope point so as to achieve maximum receiver sensitivity.

(6) The References

The rejection is based solely on the technical paper by Chung-Yu Wu et al. (hereinafter Wu), "A 1.8GHz CMOS Quadrature Voltage-Controlled Oscillator (VCO) Using the Constant-Current LC Ring Oscillator Structure." The reference describes a *constant-current* voltage-controlled LC ring oscillator, illustrated in Figure 1 thereof. Two LC VCOs are combined with a two-stage ring oscillator to improve phase noise and frequency stability.

(7) Issues

The following issues are presented: Whether claims 1-3, 10 and 11 are anticipated by Wu; whether claim 4 is anticipated by Wu; and whether claims 5 and 20 are anticipated by Wu. For purposes of the present appeal only, claims 2, 3, 10 and 11 are considered to stand or fall with claim 1, and claim 20 is considered to stand or fall with claim 5.

(8) Argument

The oscillator Wu bears some superficial similarity to the present invention. It is an I/Q oscillator and is composed of N units where $N = 2$. Although it is more accurately characterized as a ring oscillator than an LC oscillator per se, it does use within each unit what is described as an LC VCO. These superficial similarities, however, are more than outweighed

by substantial differences from the claimed invention.

Considering first claim 1, it claims in part a multiphase LC oscillator comprising N units, each unit performing a phase shift of $180^\circ/N$ of a signal, each unit comprising a voltage-to-current converter with a phase shift of $180^\circ/N$. Wu does not teach or suggest any such arrangement.

Rather, in Wu, each unit performs a phase shift of 180° , not $180^\circ/N$ as claimed. In this respect, the inverters of Wu are akin to the element in Figure 1 of the present specification coupling V_{in1} to V_{outQ} .

Furthermore, the inverters of Wu are not voltage-to-current converters as claimed. Wu itself describes Wu's oscillator as a *constant-current* voltage-controlled oscillator. Considering in particular the signals V_{o1} and V_{o2} in Wu, these signals are the output signals of the first inverter stage of Wu and the input signals of the second inverter stage of Wu. The second inverter stage of Wu may be considered to be of very high impedance, hence the currents accompanying the signals V_{o1} and V_{o2} are largely irrelevant. The first inverter of Wu cannot be described as a voltage-to-current converter if the current output is irrelevant to the operation of the circuit.

Accordingly, claim 1 is not anticipated by Wu.

Considering now claim 5, it claims in part generating multiphase (e.g., IQ) signals by performing a phase shift of $180^\circ/N$ by converting an incoming signal into a current signal having a phase shift, providing the current signal to an LC oscillator operable to generate a first

output signal (e.g., V_{out_I}), and generating at least one additional output signal using the first output signal (e.g., V_{out_Q}). As previously discussed in relation to claim 1, Wu does not teach or suggest performing a phase shift of $180^\circ/N$ by converting an incoming signal into a current signal having a phase shift.

Thus it may be seen that Wu does not anticipate claim 5.

Turning lastly to claim 4, it claims a voltage-to-current converter for use in a multiphase LC oscillator, characterized in that the voltage-to-current converter comprises compensation means to compensate for a phase shift. The oscillator of Wu does not use a voltage-to-current converter. Wu does not teach or suggest compensating such a voltage-to-current converter for a phase shift.

Accordingly, claim 4 is not anticipated by Wu.

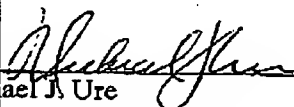
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(9) CONCLUSION

For the foregoing reasons, claims 1-5, 10, 11 and 20 are not anticipated by Wu.

Applicant respectfully submits therefore that the Final Rejection should be
REVERSED.

Respectfully submitted,

By: 
Michael J. Ure
Attorney for Applicant
Registration No. 33,089

Date: July 27, 2004